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14. ABSTRACT

The MIDHT project continues to research health information technologies (HIT) within the Conemaugh Health System, located in Southwestern Pennsylvania. Core technologies under investigation include electronic health records (EHR), picture archiving and communications system (PACS) and personal health records (PHR). In summary, the deployment of EHR's in a rural ambulatory setting has resulted in varied user satisfaction and moderate workflow efficiencies. The implementation of PACS technology at two rural hospitals resulted in a 7% decrease in duplicated chest xrays and CT scans (head) at the tertiary care hospital. Physician satisfaction regarding the ability to access images electronically was very positive. Provider and patient interest in personal health records has been limited, resulting in a small sample size to date. Additional providers and a new disease condition (gestational diabetes) have been recently added to enhance enrollment.

15. SUBJECT TERMS
Electronic Health Record Personal Health Record Metabolic Syndrome Picture Archive and Communications System User Satisfaction Gestational Diabetes

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Table of Contents

Introduction

The Military Interoperable Digital Hospital Testbed (MIDHT) is a five-year program of research to develop a real-world testbed environment in Southwestern Pennsylvania. The purpose is to research and evaluate Health Information Exchange (HIE) and health information technology (HIT) and services (HITS) that make health information readily available to consumers and providers. Ideally this will allow for the secure transfer of information between private sector rural providers, federal partners and patients. MIDHT will also define requirements and solutions to optimize healthcare resources for rural communities and identify lessons learned and best practices that benefit both the global MHS environment and stakeholders in the region. The Department of Defense (DoD) and Conemaugh Memorial Medical Center (CMMC) have common requirements for HIE, connecting disparate systems and providers and enabling secure provider-provider and provider-consumer e-communications. Minimal evidence is available on what business, clinical and technical solutions can be used to overcome the lack of specialists, infrastructure and geographical barriers associated with the delivery of care in rural communities.

Dr. Richard Wozniak, a champion of health information technologies, became the MIDHT program Principal Investigator effective 6 January 2011. Dr. Brian Lieb is the new Principal Investigator for study A -15835.2. CMMC is anticipating a site visit by Dr. Steffensen and Betty Levine on 9 June 2011 in Johnstown, Pennsylvania. An agenda is being planned and this will be a great opportunity to review all projects.

Arm 1: Longitudinal Study for Use of Interoperable Accessible Health Information Exchange Services and Technologies in Rural Communities.

This arm focused on ways a rural environment can capitalize on the use of health information network (HIN) services and technologies to promote interoperability between disparate entities so as to improve patient care, safety and quality. MIDHT investigated attitudes, usability, and effectiveness of HIN services by rural providers, including the effect of the use of HIT/HIE tools by provider groups, TRICARE providers and Conemaugh facilities on their business practices and process flows. Research initiatives focused on the impact of an electronic health record (EHR) implementation using instruments utilized in Phase 1. Additionally, researchers evaluated physicians' ability to electronically access digital radiology images performed off-site and how picture archiving and communications system (PACS) impacted productivity, decision-making and duplicate testing. Finally, an assessment of the volume of cases that Conemaugh physicians have with the Social Security Administration (SSA) regarding veteran/military disability claims and provider satisfaction with the existing paper process was completed. Northrop Grumman (NG), a key subcontractor for this effort, completed their Phase II deliverables during the previous reporting year.

Arm 2: The Impact of Consumer Informatics in the Chronic Care Model: Metabolic Syndrome and Gestational Diabetes in a Rural Setting.

This arm focuses on finding innovative solutions to slow down the growing epidemic of metabolic syndrome in the United States using consumer informatics. A personal health record (PHR) is offered to enrolled randomized subjects for six months. Subjects are able to create a PHR and communicate electronically with their physician and staff members. A total of five physician practices are participating in the study with the recent addition of a gestational diabetes group. Changes in clinical outcome measures are compared to a control group, consisting of study specific enrolled, randomized subjects. In addition, qualitative data is being assessed through a survey instrument and usage data is collected to make sound study conclusions.

Body

Southwestern Pennsylvania offers an ideal testbed for evaluating the effectiveness of health information technologies in a rural area. Conemaugh Health System (CHS) is the primary source of healthcare services in Cambria and Somerset counties, which services primarily a rural population around Johnstown, PA. The system has one tertiary care facility — CMMC and includes relatively small facilities for secondary care: Miners Medical Center (MiMC) to the north and Meyersdale Medical Center (MyMC) to the south, which is also a designated Critical Access Hospital. There are approximately 100 multi-specialty physicians in the Conemaugh Physician Group (CPG). Project specific sites for EHR implementation within CPG include Portage Health Center and NORCAM Community Health Center.

CMMC offers a continuum of care, from highly specialized services such as a Level I Regional Resource Trauma Center and a Level III neonatal intensive care unit to award-winning community wellness and clinical care. CMMC offers seven physician residencies and strong research affiliations with government and academic partners. CHS has 4,500 employees, more than 350 physicians (active and courtesy) and more than 600 licensed patient beds.

Arm 1. Longitudinal Study for the Use of Interoperable Accessible Health Information Exchange Services and Technologies in Rural Communities (A-15835.2 + A – 16192.1).

Subtask 1.1 Assess changes in provider workflows and efficiency resulting from the implementation of an ambulatory electronic medical record.

After the implementation of an EHR and a three-month stabilization period, nineteen providers between the Portage and NORCAM ambulatory facilities were each shadowed for a continuous four-hour time period. Researchers used the Time and Motion Study Tool: Ambulatory Practice (TMS-AP), developed by Partners HealthCare, in order to be consistent with previous work. The new data set ("POST") from 2010 allowed for a statistical comparison to the "PRE" data set collected in 2008.

Location	Subject	Date
Portage	Clerical	6/14/2010
Portage	Clinical	6/14/2010
Portage	Physician	6/14/2010
NORCAM	Clinical	6/21/2010
NORCAM	Physician	6/21/2010
NORCAM	Clerical	6/21/2010
Portage	Clinical	6/28/2010
Portage	Clerical	6/28/2010
Portage	Physician	6/28/2010
NORCAM	Physician	6/30/2010
NORCAM	Clerical	6/30/2010
NORCAM	Clinical	6/30/2010
Portage	Physician	7/7/2010
Portage	Office Manager	7/7/2010
Portage	Clerical	7/7/2010
NORCAM	Office Manager	7/19/2010
NORCAM	Clerical	7/19/2010
Portage	Clinical	8/13/2010
Portage	Physician's Assistant	11/4/2010

Table 1. EHR POST Observations Schedule

[*Mann-Whitney Test (MWT) with Alpha = 0.05 was used for all significance testing. Note, MWT utilizes ranks and not means.*]

The variable, percent of time period total time, was calculated independently for each time period (PRE and POST) using the same procedure; namely, the time for each observed activity was normalized by dividing it by the total time of the period in which it was recorded and then multiplying the dividend by 100. This mitigates the difference in total time between time periods

and allows for more accurate, interpretable, and directly comparable results between time periods. For readability, the variable, percent of time period total time, will henceforth be denoted as percent time.

Location	Aggregated: paper or electronic	Time Period	N	d(N)	Sum	d(Sum)	Mean	d(Mean)
NORCAM	paper	PRE	510	-297	11.837	-7.821	0.02321	-0.004357
		post	213		4.016		0.01885	
	ELECTRONIC	PRE	149	751	3.534	11.379	0.02372	-0.007146
		post	900		14.912		0.01657	
Portage	paper	PRE	540	-237	13.244	-10.248	0.02453	-0.014639
		post	303		2.996		0.00989	
	ELECTRONIC	PRE	336	737	7.324	7.920	0.02180	-0.007590
		post	1073		15.244		0.01421	

Table 2. Paper vs. Electronic Usage

Note: the d() nomenclature denotes change-in that quantity, (POST – PRE)

d(N) = change in the number of observed activities

d(Sum) = change in the sum of percent time of the activities contained in the grouping indicated

d(Mean) = change in the average percent time elapsed per observed activity

A significant change (POST – PRE) exists for both NORCAM and Portage for activities aggregated into categories of paper and electronic. Also of note are the magnitude and direction of change demonstrated by d(N) and d(Sum):

Change-in, (variable description)	**variable**	**Paper, (aggregated)**		**ELECTRONIC, (aggregated)**	
		NORCAM	*Portage*	*NORCAM*	*Portage*
Activity count	d(N)	58% reduction	44% reduction	5 fold increase	2 fold increase
Percent time Sum	d(Sum)	8% reduction	10% reduction	11% increase	8% increase

Table 3. Paper vs. Electronic Usage

Time and Motion Conclusion

A significant negative change (post – pre) on the variable, percent time, was found for various processes at Portage and NORCAM. The results for NORCAM suggest that productivity (on a time basis) improved for medication orders and renewals, receiving lab/test results, medical records management, phone calls with patients, scheduling patient appointments and revenue cycle. The results for Portage suggest that productivity (on a time basis) improved for medication orders and renewals, writing orders and scheduling tests, receiving lab/test results, medical records management, phone calls with patients, scheduling patient appointments and revenue cycle. Investigators conclude that the implementation of an electronic health record directly improved medication orders and renewals, receiving lab/test results, and medical records management; the electronic health record did not improve productivity associated with clinical notes, transcription and dictation. Furukawa[1] found that electronic medical records have a mixed association with efficiency and productivity during office visits.

In reference to Table 5, N is defined as the aggregate number of distinct activities performed during the Time & Motion observations. The unit for the "Sum" column is hours. The negative d(Mean) can be interpreted as a decrease in the average of percent time required for an activity, which implies increased productivity.

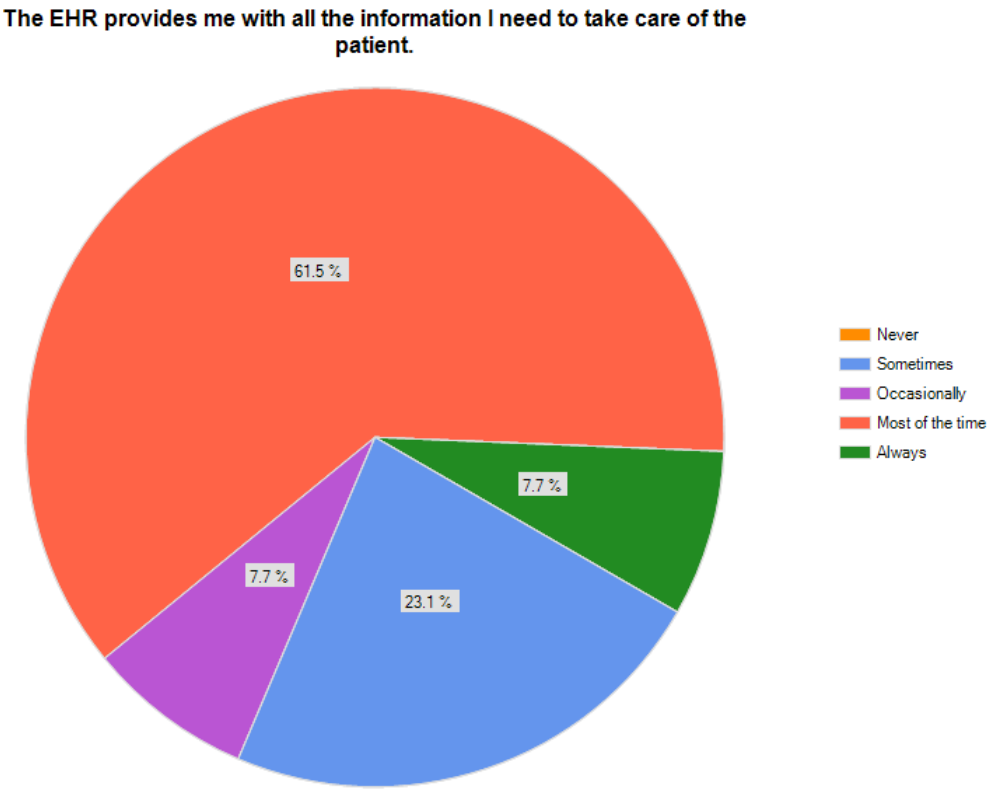
Process	ID Number
Medication Orders/Renewals	1
Write Dx Orders/Scheduling Tests & Referrals	2
Receiving Lab/Test Results	3
Medical Records Management	4
Clinical Notes/Transcription/Dictation	5
Phone - Patient	6
Scheduling Patients in Office	7
Talking - Colleague/Walking Inside	8
Revenue Cycle	9
Remaining Activities Not Under Analysis	0

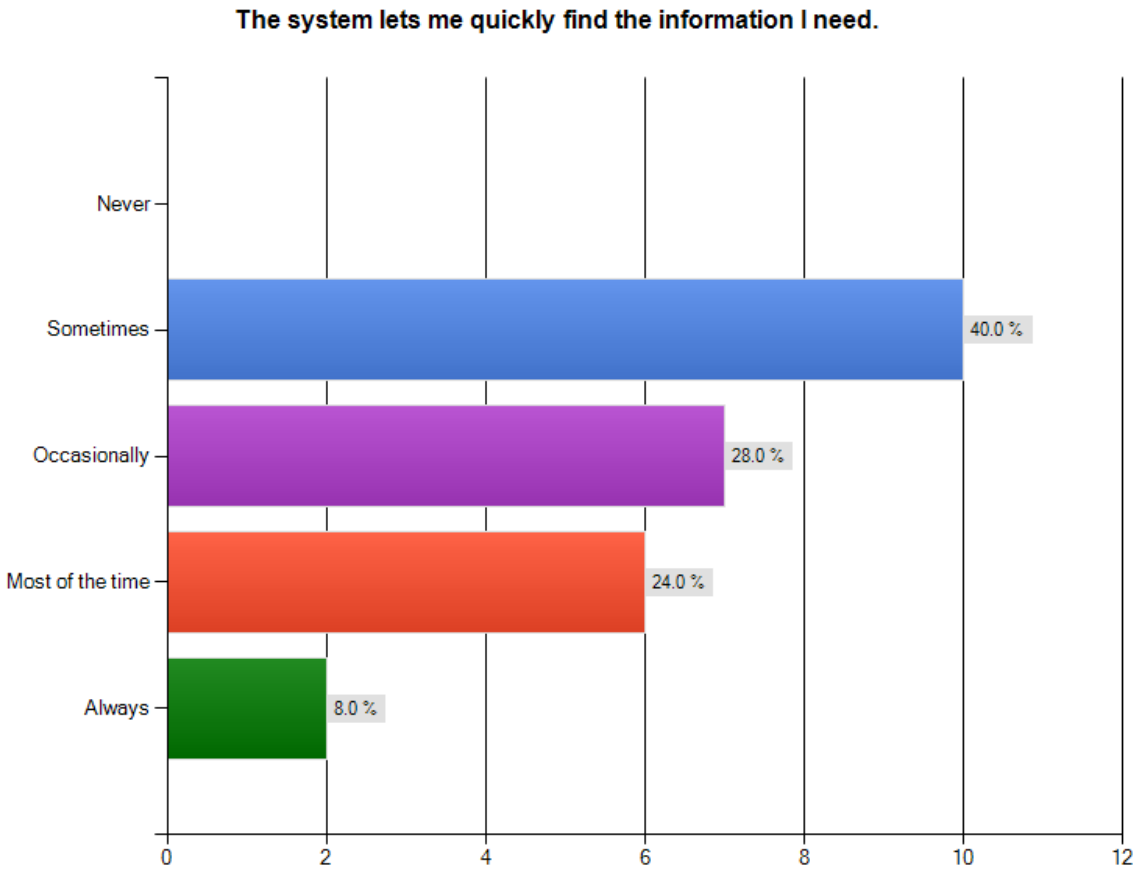
Table 4. Process Description

Location	MIDHT Process	Time Period	N	d(N)	Sum	d(Sum)	Mean	d(Mean)
NORCAM	0	PRE	426	441	16.914	0.750	0.03970	-0.01933
		post	867		17.664		0.02037	
	1	PRE	36	34	1.011	0.161	0.02807	-0.01133
		post	70		1.172		0.01674	
	2	PRE	38	35	1.007	0.695	0.02651	-0.00319
		post	73		1.703		0.02332	
	3	PRE	34	-18	0.749	-0.584	0.02203	-0.01174
		post	16		0.165		0.01029	
	4	PRE	201	320	5.522	2.814	0.02747	-0.01147
		post	521		8.336		0.01600	
	5	PRE	254	-155	5.746	-3.440	0.02262	0.00067
		post	99		2.306		0.02330	
	6	PRE	81	29	2.373	-0.005	0.02930	-0.00777
		post	110		2.368		0.02153	
	7	PRE	67	147	1.398	1.659	0.02086	-0.00657
		post	214		3.057		0.01428	
	8	PRE	232	-20	3.054	-0.140	0.01316	0.00058
		post	212		2.914		0.01375	
	9	PRE	60	28	1.240	0.237	0.02067	-0.00388
		post	88		1.477		0.01679	
Portage	0	PRE	770	687	29.032	2.023	0.03770	-0.01639
		post	1457		31.056		0.02131	
	1	PRE	74	-48	2.358	-2.006	0.03186	-0.01833
		post	26		0.352		0.01353	
	2	PRE	104	5	2.356	-0.629	0.02266	-0.00681
		post	109		1.728		0.01585	
	3	PRE	42	-2	0.900	-0.209	0.02143	-0.00417
		post	40		0.691		0.01726	
	4	PRE	313	171	9.066	-3.537	0.02896	-0.01754
		post	484		5.529		0.01142	
	5	PRE	240	30	5.419	0.428	0.02258	-0.00092
		post	270		5.847		0.02166	
	6	PRE	137	109	5.154	-2.173	0.03762	-0.02550
		post	246		2.981		0.01212	
	7	PRE	32	231	0.702	2.108	0.02194	-0.01126
		post	263		2.810		0.01068	
	8	PRE	351	201	5.376	1.035	0.01532	-0.00370
		post	552		6.411		0.01161	
	9	PRE	9	97	0.623	0.812	0.06917	-0.05563
		post	106		1.435		0.01353	

Table 5. Time & Motion Summary

Survey opportunities were made available to staff so that qualitative assessment of user satisfaction of the Allscripts EHR could be undertaken. The survey used was retrieved from the Agency for Healthcare Research and Quality (AHRQ) survey compendium and modified for use. An attempt was made to determine if satisfaction changed over time (June 2010, November 2010 and May 2011) but the low sample size prevents analysis. Below are descriptive results of some important questions (n=26):





Survey Conclusion

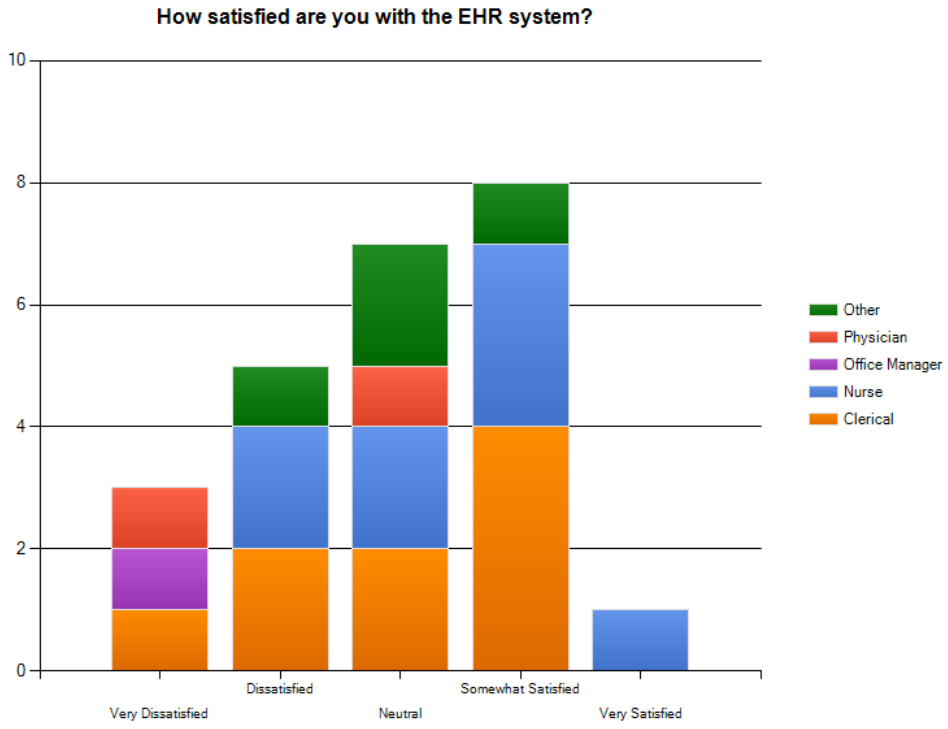
Compared to previous routines, the following activities are easier when using the EHR as stated by a majority of respondents:

- Documenting allergies
- Documenting CPT and ICD-9 codes for billing purposes
- Keeping problem lists updated
- Reviewing laboratory and radiology results
- Writing and renewing prescriptions
- Monitoring medication safety during prescribing
- Communicating referral information to specialists

Furthermore, approximately 50% of respondents agree that the EHR has enabled them to accomplish tasks more quickly, has enhanced job effectiveness and made it easier to do their job. Whereas 45% of respondents state they work longer hours to see the same number of patients. There is no clear consensus that the EHR has caused disruptions to their workflow.

As represented by the column graph below of satisfaction opinions amongst staff at Portage and NORCAM, an overall ambivalence towards the implementation with almost one third stating a neutral satisfaction. When looking at position type, no apparent trends are noted (Note: "Other" most likely includes some physicians). Our satisfaction results are much lower than those reported by DesRoches et al[2] regarding a 2008 national survey of physicians on EHR's. Only 34% of CMMC staff is satisfied whereas 90% of physicians surveyed nationally were satisfied.

Written comments most often cited suggest that staff appreciate not having to pull and refile paper charts, access to hospital information (e.g. lab/rad results) is much easier (direct interface to Allscripts), and benefits of ePrescribing. On the negative, staff members are frustrated with the multiple screens and not being able to quickly find information, creating clinical notes is too cumbersome, determining which tests were ordered was more difficult and more training is needed. Statistical testing (if applicable) will be completed next quarter. Productivity data (e.g. RVU's, billing charges) has been received from the Finance department and that analysis is pending.



Subtask 1.2 Enhance the service-based HIE infrastructure and services to support further exchange of digital medical imaging information in a rural setting.

**** Task completed during previous annual reporting period****

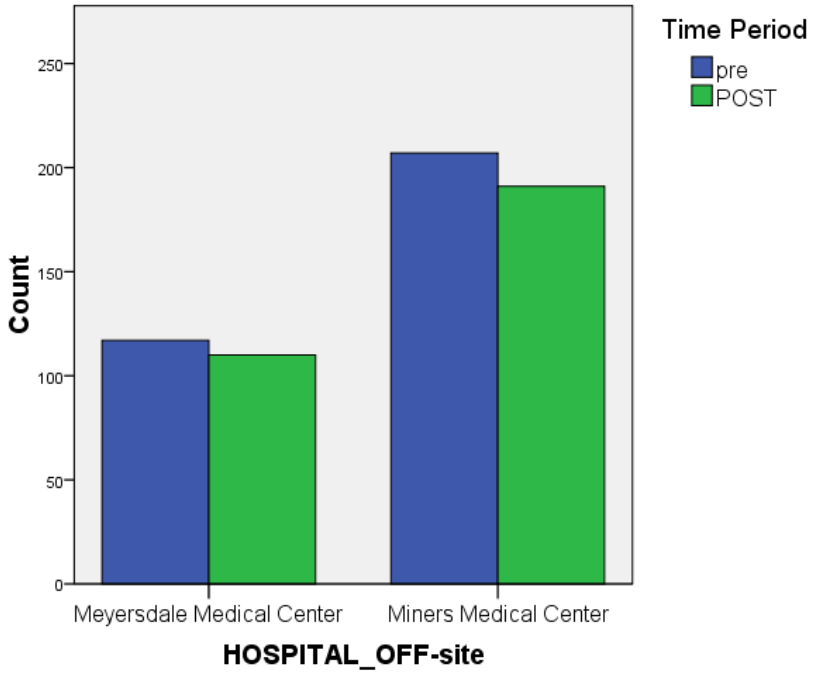
Subtask 1.3 Research and evaluate the ability to electronically exchange digital images and how this functionality will affect the delivery of patient care within a rural health care system, to include an analysis on provider productivity, throughput, duplicative testing and continuity of care.

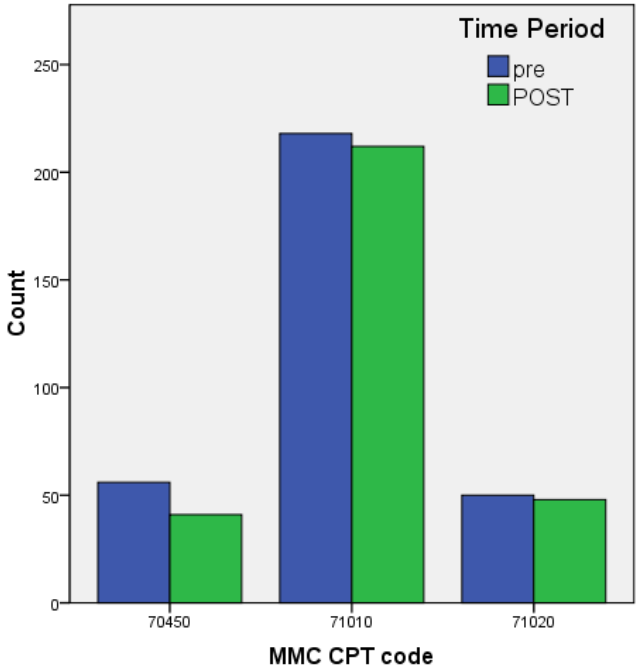
Duplicate Imaging

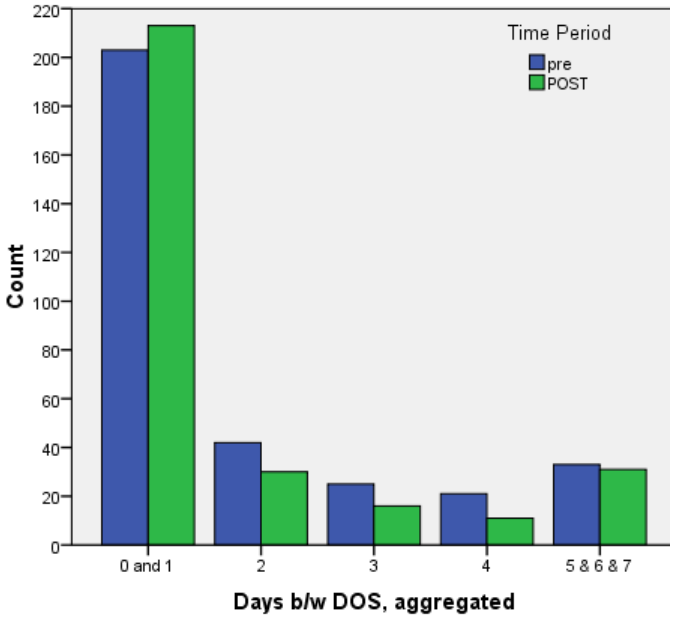
P R E (baseline)		P O S T	
		Phase 1	*Phase 2*
2008	*2009*		*2010*
July *through* December	**January *through* June**	**July *through* December**	**January *through* June**

Table 6. Time period.

The Initiate Enterprise Master Patient Index (EMPI) software was used to correlate and match different medical record numbers across facilities for the same patient. Due to this procedure, duplicate tests within the same facility were identified by the study team with a high degree of confidence. Significance testing for hypothesis #1 has been completed with the following results for the count of tests originating at Miners/Meyersdale and duplicated at Memorial (CPT 71010, 71020, 70450) by time period is presented below:







A Chi-Square test of independence applied to either Days between date of service (DOS) or aggregated Days between DOS over time period does not yield a significant result yet a 7% reduction in duplicate imaging is noted. No statistical significance was found by CPT code. Radiology volume data by CPT code for Miners and Meyersdale is homogeneous between the pre and post data sets. The results are more favorable than what You[3] discovered in a similar duplicate imaging study in Canada. You found a 0.1% reduction in chest x-rays and 0.2% reduction in CT scans of the head whereas CMMC researchers found a 2.9% reduction in chest x-rays and a 26.8% reduction in CT scans of the head.

Aggregated Days b/w DOS	**CPT Code**	**pre**	**POST**	**Total**	***Change, (POST - PRE)***
0 & 1	All – study specific	203	213	416	*10*
2		42	30	72	*-12*
3		25	16	41	*-9*
4		21	11	32	*-10*
5 & 6 & 7		33	31	64	*-2*
Column Totals:		**324**	**301**	**625**	**-7%**

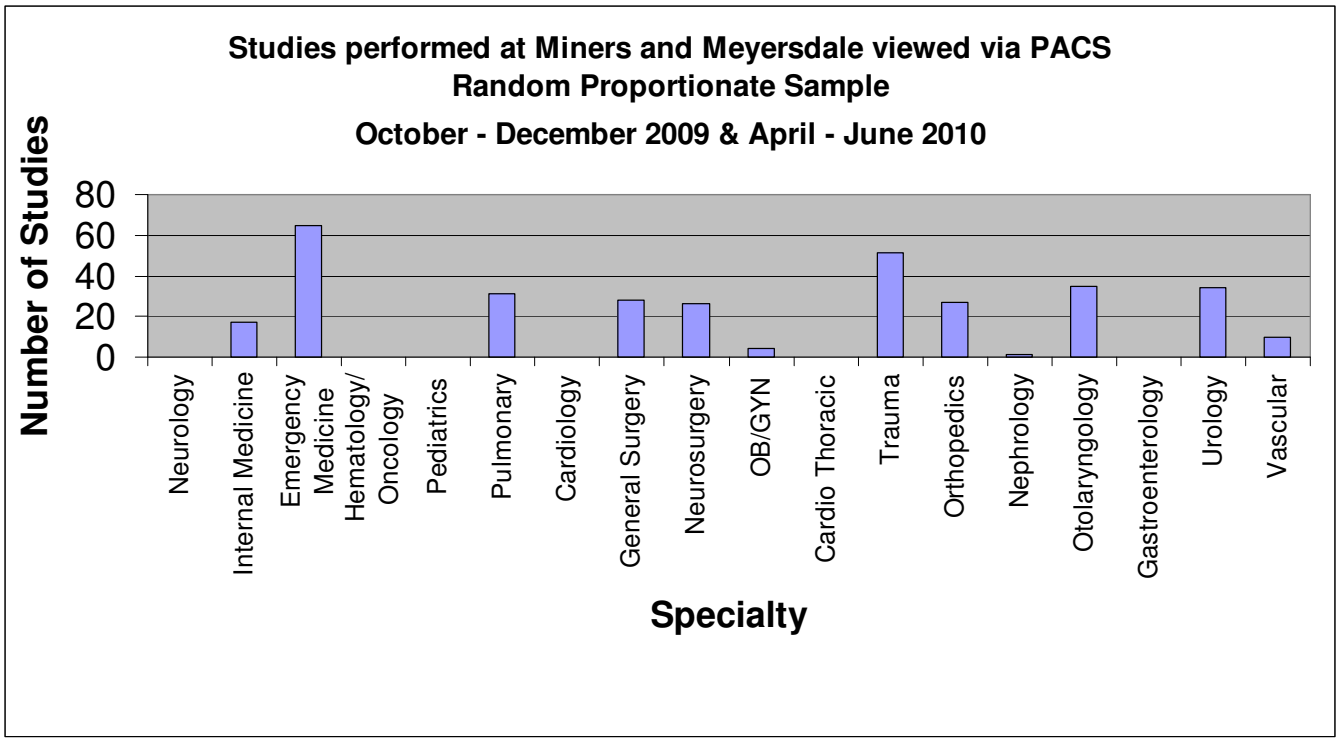
Table 7. Count of duplicated images by days between DOS

A financial analysis of the resulting seven percent reduction in duplicated chest x-rays and CT scans of the head suggests a savings of $187,075 to patients and/or insurance companies.

PACS User Reports

A randomized proportionate sample of PACS users on the CMMC medical staff were identified to collect data on their viewing of images that originated from Miners and/or Meyersdale facilities. Management Information Systems provided reports to the study team, 38% (27/70) of physicians had applicable data. Please refer to the following graph for more information. When comparing POST Phase 1 & 2 data, count is very similar so they were consolidated.

As depicted below, the most active users of the PACS system in terms of viewing images originating from Miners and Meyersdale are Emergency Medicine (65) and Trauma (51) physicians. This result is expected as Memorial Medical Center (MMC) is a tertiary care hospital with a Level I trauma center. The next level includes Otolaryngology (35), Urology (34), and Pulmonary (31). A third level includes General Surgery (28), Orthopedics (27) and Neurosurgery (26).



Note – graph does not depict usage by an orthopedist (outlier)

Sample Size (n) = 70 physicians

Cardiology = 6
Cardio Thoracic = 1
Emergency Medicine = 9
Gastroenterology = 2
General Surgery = 5
Hematology/Oncology = 3
Nephrology = 3
OB/GYN = 3
Orthopedics = 5
Otolaryngology = 2
Pediatrics = 5
Pulmonary = 3
Internal Medicine = 12
Trauma = 2
Neurology = 4
Urology = 2
Neurosurgery = 2
Vascular = 1

Physician Surveys

The qualitative surveys collected that indicated that the physician never used PACS to access images from Miners and Meyersdale were removed from the dataset before analysis. The remaining responses (n=55) formed the dataset of analysis. Although not statistically significant (alpha=0.05), the bar chart below clearly shows that those respondents who indicated having previous experience with PACS used the system more than those who had not had previous PACS experience.

Investigators decided to focus on the following questions:

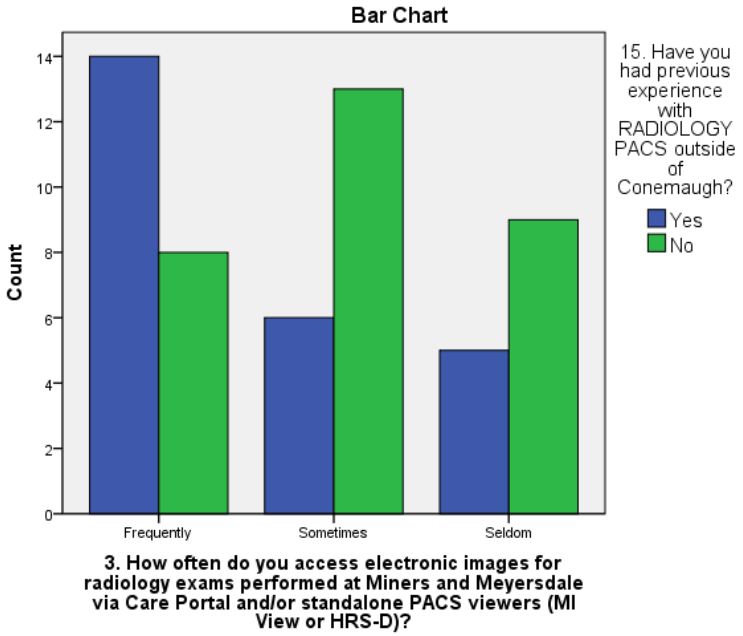


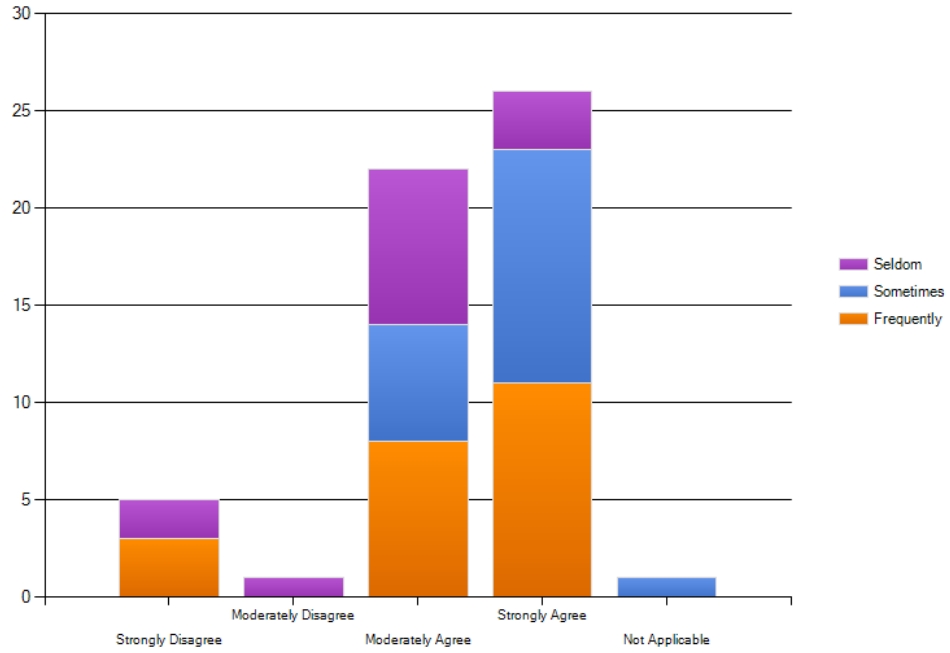
Table 8. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.944[a]	2	0.084
Likelihood Ratio	5.002	2	.082
Linear-by-Linear Association	3.270	1	.071
N of Valid Cases	55		

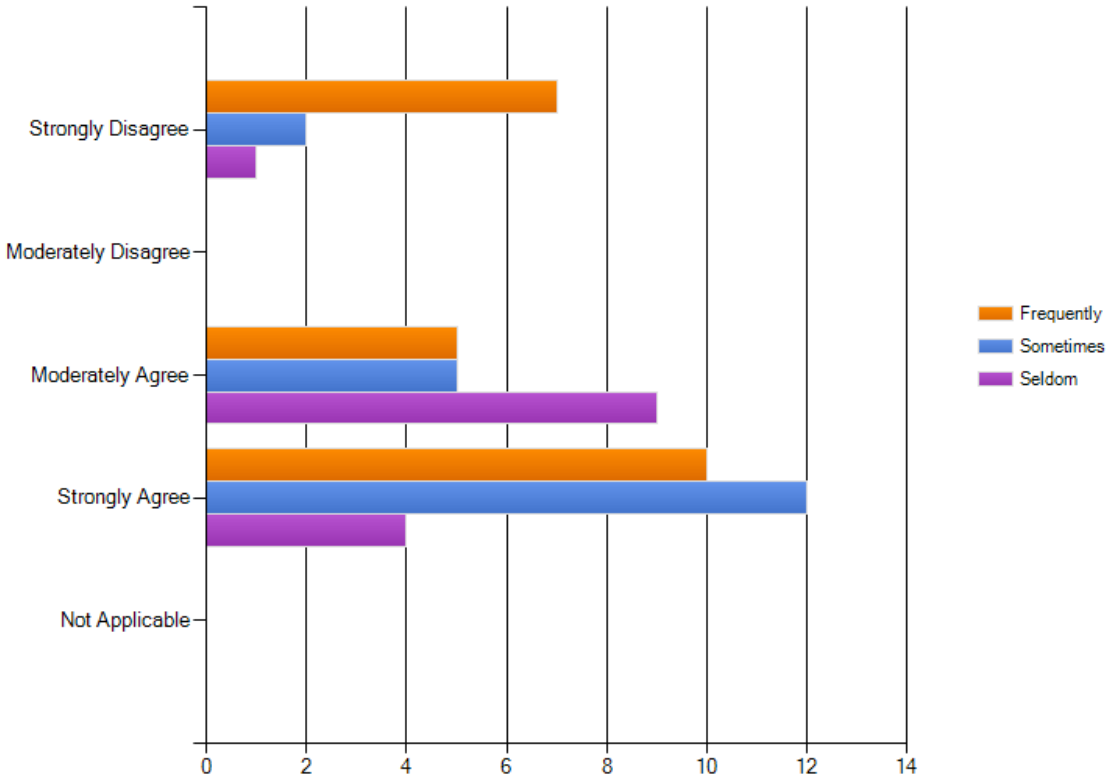
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.36.

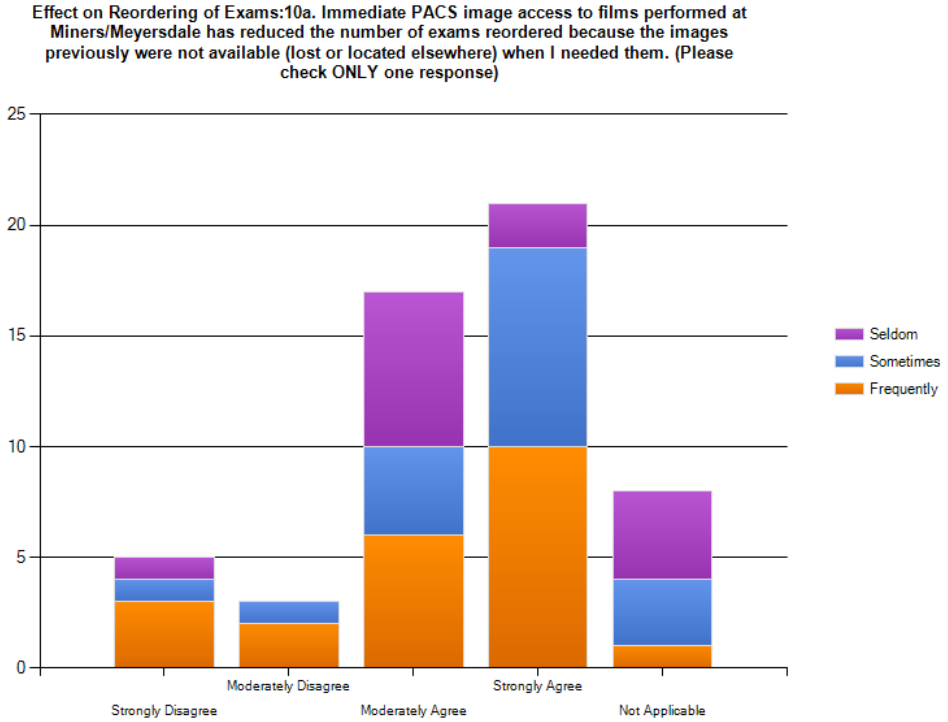
The results suggest that the PACS implementation at rural hospitals (Miners and Meyersdale) had a positive impact on providers and patients. A majority of physicians (87%) believe that image access has improved productivity whereas 81% of physicians believe that immediate PACS image access has improved physicians' ability to make decisions regarding patient care. Furthermore, 70% of physicians agree that immediate PACS image access has reduced the number of exams reordered because images taken previously were not known about or not available in a timely manner.

Productivity:7a. My productivity has improved because of image access. (Please check ONLY one response)



Decision Making:8a. Immediate PACS image access has improved my ability to make decisions regarding patient care. (Please check ONLY one response)





Questions 6-10 were analyzed using the original scale, a 5 level Likert scale, and an aggregation (collapsing) of that scale comprised of 3 levels:

Answer Choice on survey:	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable
Answer code for survey question:	1	2	3	4	0
Answer code for Aggregation:	1		2		0

Table 9. Likert Scale Aggregation

Those questions related to Productivity (6a, 6b, 7a, 9a, 10a) individually and collectively indicate an overall positive (Agree) response as demonstrated by both the bar (column) graphs and means. Likewise, the questions (6c, 8a) related to decision making also indicate an overall positive (Agree) response, both individually and collectively.

Question	N	min	MAX	Mean	
6. a) RADIOLOGY PACS has reduced the time I must wait to review an image.	55	1	4	3.45	
6. a) aggregated: Disagree, Agree, N/A	*55*	*1*	*2*	*1.87*	
6. b) I access images more frequently with RADIOLOGY PACS than I did with film.	54	0	4	3.35	
6. b) aggregated: Disagree, Agree, N/A	*54*	*0*	*2*	*1.76*	
6. c) RADIOLOGY PACS has facilitated consultation between myself, other clinicians and/or radiologists at other healthcare locations.	55	0	4	3.05	
6. c) aggregated: Disagree, Agree, N/A	*55*	*0*	*2*	*1.69*	
7a. My productivity has improved because of image access. (Please check ONLY one response)	55	0	4	3.22	
7. a) aggregated: Disagree, Agree, N/A	*55*	*0*	*2*	*1.85*	
Decision Making: 8a. Immediate PACS image access has improved my ability to make decisions regarding patient care. (Please check ONLY one response)	55	1	4	3.11	
8. a) aggregated: Disagree, Agree, N/A	*55*	*1*	*2*	*1.82*	
Effect on Patient Transfers: 9a. Immediate PACS image access has reduced the number of patient transfers between facilities due to the ability to share images and consult remotely. (Please check one response)	55	0	4	1.73	
9. a) aggregated: Disagree, Agree, N/A	*55*	*0*	*2*	*1.00*	
Effect on Reordering of Exams: 10a. Immediate PACS image access to films performed at Miners/Meyersdale has reduced the number of exams reordered because the images previously were not available (lost or located elsewhere) when I needed them.	54	0	4	2.70	
10. a) aggregated: Disagree, Agree, N/A	*54*	*0*	*2*	*1.56*	

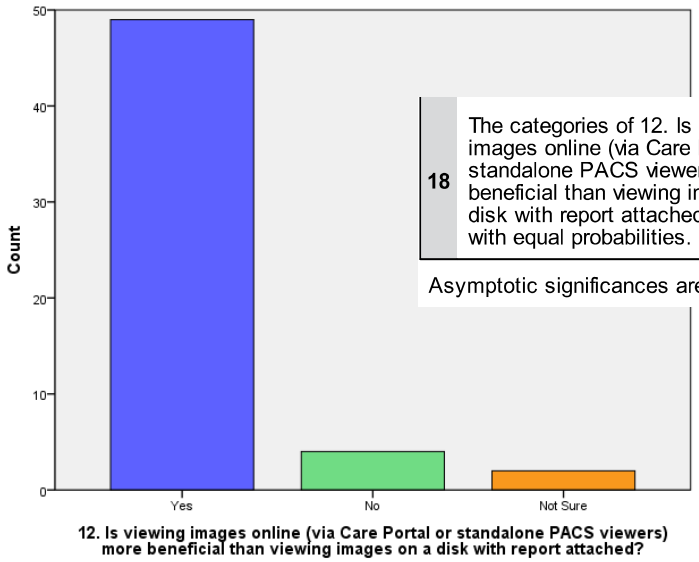
Table 10. Descriptive Statistics.

Hypothesis testing of those questions indicate that the response per category most probably represents a real difference in respondent opinion. With the exception of question 9, the results of the hypothesis testing do not change for the aggregations of the responses of those questions. Question 9 yields the opposite result upon aggregation due to the relatively high number of "Not Applicable" responses. [Asymptotic significance at the 0.05 level is shown for all hypothesis testing.]

Null Hypothesis	Test	Sig.	Decision
The categories of 6. a) RADIOLOGY PACS has reduced the time I must wait to review an image. occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
The categories of 6. b) I access images more frequently with RADIOLOGY PACS than I did with film. occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
The categories of 6. c) RADIOLOGY PACS has facilitated consultation between myself, other clinicians and/or radiologists at other healthcare locations. occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
The categories of Productivity: 7a. My productivity has improved because of image access. (Please check ONLY one response) occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
The categories of Decision Making: 8a. Immediate PACS image access has improved my ability to make decisions regarding patient care. (Please check ONLY one response) occur with equal probabilities.	One-Sample Chi-Square Test	.030	Reject the null hypothesis.
The categories of Effect on Patient Transfers: 9a. Immedicate PACS image access has reduced the number of patient transfers between facilities due to the ability to share images and consult remotely. (Please check one response) occur with equal probabilities.	One-Sample Chi-Square Test	.010	Reject the null hypothesis.
The categories of Effect on Reordering of Exams: 10a. Immediate PACS image access to films performed at Miners/Meyersdale has reduced the number of exams reordered because the images previously were not available (lost or located elsewhere) when I needed them. (Please che occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.

The categories of 9. a) aggregated: Disagree, Agree, N/A occur with equal probabilities.	One-Sample Chi-Square Test	.748	Retain the null hypothesis.

Additionally, physicians overwhelmingly indicated that viewing images using PACS rather than on disk (report included) is more beneficial.



18	The categories of 12. Is viewing images online (via Care Portal or standalone PACS viewers) more beneficial than viewing images on a disk with report attached? occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Study Conclusion

In summary, the analysis strongly indicates that, overall, CMMC physicians believe that the implementation and availability of PACS at the rural facilties is beneficial relative to productivity, decision making, and duplicate testing. Although the results were not statistically significant, a 7% reduction in duplicated chest x-rays and CT scans of the head (0-7 days) is noteworthy and does mildly align with positive physician opinion. Finally, the implementation of PACS technology clearly has reduced costs and patient exposure to radiation.

Subtask 1.4 Deploy (via portal technology) a pilot demonstration of the electronic exchange of private sector ambulatory medical records with the DoD and other selected stakeholders using test data.

**** Task completed during previous annual reporting period****

Subtask 1.5 Perform a technical feasibility study to focus on repurposing the BHIE-AHLTA web services toward the existing NHIN Federal Adapter for the purpose of standards based exchange of Military Health System data domains with private sector partners.

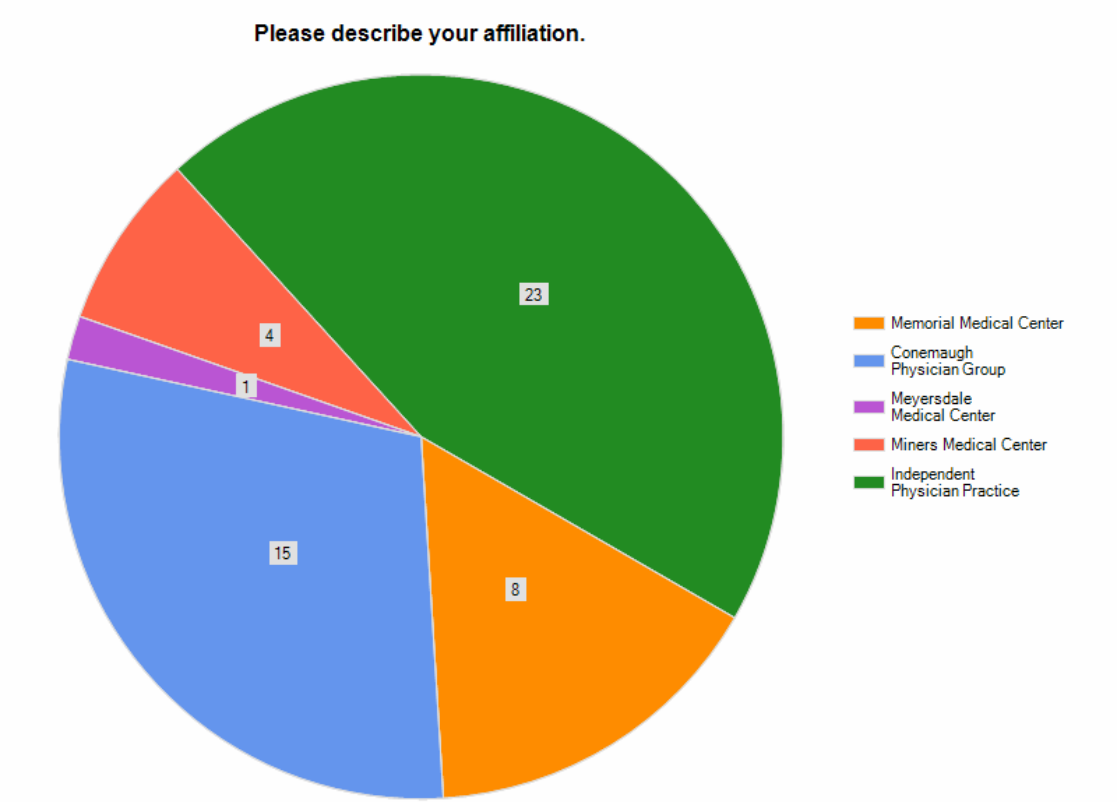
**** Task completed during previous annual reporting period****

Subtask 1.6 Begin development on a private sector version of the Federal Gateway/Adapter (work to be based on the code that is anticipated to be available from ONC) using interoperable HITSP standards to progress the goals of this national effort.

**** Task completed during previous annual reporting period****

Subtask 1.7 Perform an assessment of the volume of cases that Conemaugh physicians have with SSA regarding veteran/military disability claims and assess provider satisfaction with existing SSA process for information gathering and submission.

The provider survey, assessing the submission process of medical information for Social Security disability cases, was distributed to various office managers within the Conemaugh Health System in June 2010. Fifty one (n=51) providers responded to the survey as depicted below.



Investigators selected the following questions as most important to understand the current landscape and assess future provider acceptance of an electronic record submission process (e.g. Nationwide Health Information Network) to the Social Security Administration.

Chi-Square test was used to test for independence between question response choices. Independence was found for the response choices for Q3, Q5, Q6 and Q9. Independence cannot be stated for the answer choices of Q10. The Mann-Whitney test was employed to investigate the difference between the responses grouped into CHS and Independent Physician Practice. No between group significance was found for any question. Additionally, the response set was grouped into CHS, CPG, and Independent Physician Practice. Using the Kruskal Wallis test, no between group significance was found for any question.
In order to increase the count for statistical hypothesis testing, the 5-choice scale contained in the original survey was reduced to a 3-point scale -- unsatisfied (sum of very unsatisfied and

unsatisfied), neutral, and satisfied (sum of satisfied and very satisfied) for Q9. Since only 5 responses were unsatisfied, independence (by Chi-square test) was found between that choice and each of the other two. Next, the neutral response count versus that of satisfied was tested. No independence was shown. By the Mann-Whitney test, no significance was found when the response set was grouped into CHS and Independent Physician Practice. Likewise, the Kruskal Wallis test did not show significance when the response set was grouped into CHS, CPG, and Independent Physician Practice. Therefore, the hypothesis that Conemaugh providers will prefer an electronic system for submission of medical records to the SSA rather than the existing paper system cannot be accepted.

Question	Answer Options	Response Percent	Response Count, (n)
3. On average, how many requests for medical records do you receive monthly regarding SSA disability cases?	0-10	76.5%	39
	11-20	15.7%	8
	21-30	5.9%	3
	31-40	2.0%	1
	41-50	0.0%	0
	51+	0.0%	0
5. On average, what percent of those patient requests involve military beneficiaries or veterans (e.g. TRICARE)?	0-10%	93.9%	46
	11-25%	6.1%	3
	26-50%	0.0%	0
	51-75%	0.0%	0
	76-100%	0.0%	0
6. On average, how long does it take to complete and send the proper paper medical records for one patient?	0-15 minutes	28.6%	14
	16-30 minutes	44.9%	22
	31-45 minutes	22.4%	11
	46-60 minutes	4.1%	2
	1-2 hours	0.0%	0
	2 hours +	0.0%	0
9. Please rate your level of satisfaction with the SSA medical record submission process.	Very unsatisfied	2.0%	1
	Unsatisfied	8.2%	4
	Neutral	49.0%	24
	Satisfied	36.7%	18
	Very Satisfied	4.1%	2
	Reduction from 5 choice to 3 choice Likert scale		
	Unsatisfied	10.2%	5
	Neutral	49.0%	24
	Satisfied	40.8%	20

10. Would you personally use an electronic processing system for submitting medical records that would result in significantly reduced SSA determination times for your patients (e.g. Nationwide Health Information Network)?	Yes	34.8%	16
	No	23.9%	11
	Need More Information	41.3%	19

Table 12. SSA Survey Responses.

Arm 2: The Impact of Consumer Informatics in the Chronic Care Model: Metabolic Syndrome and Gestational Diabetes in a Rural Setting (A-15835.1).

Subtask 2.1 Deploy HIE tools for patient and community outreach in varied rural environments.

Subject recruitment for the respective personal health record study has been challenging. Interest has been greatest from patients deriving from suburban physician offices whereas anecdotal concerns persist regarding Internet access and an elderly population in rural communities. New recruitment ideas are consistently being discussed and implemented. Dr. Kavitha Manjunath joined the study in September 2010 and Dr. Kevin Sugalski joined the study in May 2011. Furthermore, a gestational diabetes (GD) arm was added because of provider interest and an opportunity to increase sample size through a different subject population. The GD revisions were approved by both Institutional Review Boards (Conemaugh – 23 May 2011 and USAMRMC – 31 May 2011). Revised Statement of Work was approved on 26 May 2011. This revision adds three physicians, four midwives, and one physician assistant from Conemaugh OB/GYN Associates to the study.

Below is a summary enrollment table:

MIDHT PHR	
Inquiries	**111**
Screenings	**38**
Enrolled (PHR)	**18**
Enrolled (Control)	**15**
Screen Failures	**5**
Withdrawals	**6**
Completed	**19**
As of 31 May 2011	

Table 13. Summary Enrollment.

Subtask 2.2 Research and evaluate the impact of a personal health record (PHR) on provider(s) and consumer(s) with particular focus on chronic disease prevention.

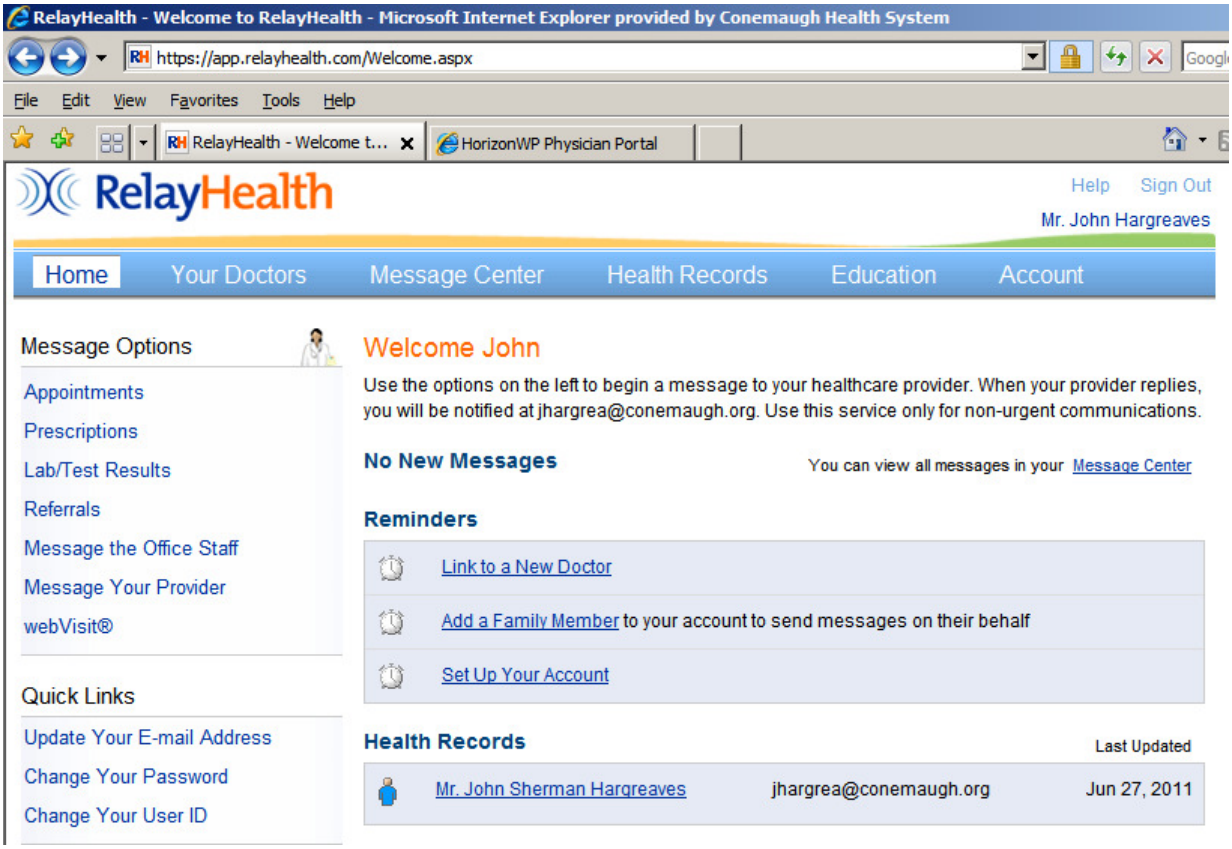
The opportunity to create secure, online personal health records and send electronic messages to providers through RelayHealth has not been well received by patients. Recruitment challenges align with low adoption of said technology nationwide. The California Healthcare Foundation reports that only 7% of U.S. adults use some sort of PHR, with 51% being supplied by their health insurance plan.[4] In addition, consumers in rural areas have known issues with access to the Internet, low self-awareness of their health conditions and an elderly population that is hesitant with technology adoption. Finally, consumers have stated concerns with putting their health information online due to theft and privacy invasion.

In order to assess patient interest in the study, CMMC staff has used various communication strategies over the past year. This will continue to be a focus in the coming months.

- Direct patient letters
- Advertisements in numerous newspapers
- Facebook postings
- Flyers and posterboards in participating physician offices
- Phone On Hold messages
- Global emails
- Face-to-face meetings with physicians
- Health Fairs

Core online PHR functionality includes:

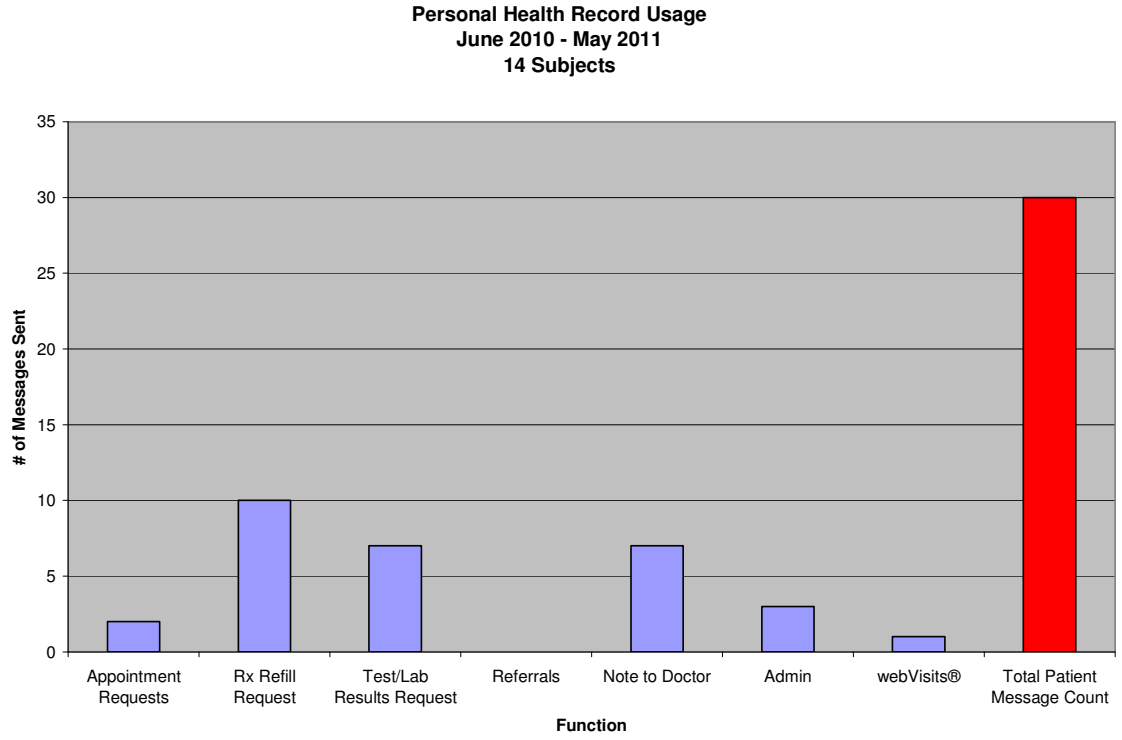
- Request Appointments
- Request Prescription Renewals
- Request Lab and Test Results
- Note to Doctor
- Note to Office
- Access to education materials
- webVisit®



It is important to note that some participating physicians have been resistant to responding to subject messages through RelayHealth as reflected by qualitative feedback from subjects. This finding is not surprising as physician perception of PHR's are likely to vary from total abhorrence to complete support. Physicians have stated concerns with the accuracy and privacy of PHRs and have expressed doubts that patients will take the time to create PHRs and keep them updated.[5]

Subtask 2.3 Research and evaluate the impact of web-based secure messaging, online consultations, prescription renewals, and appointment scheduling on consumer awareness and their ability to effectively self manage their health compared to those consumers not using a PHR.

The following graph shows subject usage of specific PHR message types. Subjects prefer the Rx refill requests, request lab/test results, and "Note to Doctor" functionality whereas requesting appointment requests and webVisits are used less frequently.



In terms of subject creation of personal health records, data is entered more frequently for meds and allergies, problems and procedures, and family and social history. Numbers below refer to number of subjects who entered the respective data (not a specific item count).

Meds and Allergies	Problems and Procedures	Results	Vitals	Family & Social Hx	Immunizations	Files
14	7	2	0	9	5	1

Interim data analysis regarding the specific health outcome measures (e.g. labs, blood pressure, weight, etc) will be completed once the number of completed subjects reaches 25.

Key Research and Development Accomplishments

Arm 1

- Assessed staff satisfaction of the Allscripts electronic health record
- Completed Time & Motion observations and resulting data analysis
- Completed data collection and analysis of duplicated images over a 2 year time period
- Assessed physician satisfaction of PACS technology at Miners and Meyersdale
- Determined number of "off-site" images accessed by CMMC users for a sample period

Arm 2

- Active Personal Health Record study with two arms (metabolic syndrome + gestational diabetes)

Reportable Outcomes

- Conemaugh Research Poster Symposium: 28 March – 1 April 2011
- Image Sharing (PACS) Manuscript: in progress, submission targeted for the Journal of Radiology
- TATRC Product Line Review: 15 March 2011

Conclusion

The MIDHT project continues to research health information technologies (HIT) within the Conemaugh Health System, located in Southwestern Pennsylvania. Core technologies under investigation include electronic health records (EHR), picture archiving and communications system (PACS) and personal health records (PHR).

In summary, the deployment of EHR's in a rural ambulatory setting has resulted in varied user satisfaction and moderate workflow efficiencies. The implementation of PACS technology at two rural hospitals resulted in a 7% decrease in duplicated chest xrays and CT scans (head) at the tertiary care hospital. Physician satisfaction regarding the ability to access images electronically was very positive. Provider and patient interest in personal health records has been limited, resulting in a small sample size to date. Additional providers and a new disease condition (gestational diabetes) have been recently added to enhance enrollment.

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